

Status of the Claims

Claims 1-4, 7 and 8 are presented. No claims have been added, amended or canceled.

Summary Of The Claimed Invention

The presently claimed invention relates to improvements in disc brake rotor thermal fatigue and wear-resistance by the use of additives in the cast iron compositions used for such disk brake rotors which avoid detrimental micro-structures with inner-granular carbide eutectic phases and which enhance wear-resistance. The claimed composition comprises between 0.35 and 0.45% by weight of vanadium and between 0.025 and 0.035% by weight of titanium (an amount of titanium representing between 1/10 and 1/18 the amount of vanadium) and between 0.675 and 1.2% by weight of copper.

An important aspect of the present invention is the careful selection and balance of the amounts of vanadium and titanium to achieve the desired enhancement to thermal fatigue and wear-resistance of brake rotors made from such compositions while, at the same time, avoiding a number of problems in manufacturing and use. These problems include difficulty in machining of rotors, slow "bedding-in" of rotors, and increased wear of friction material. The particular amounts and proportions of vanadium and titanium realize an unappreciated advantage by allowing the compositions of the present invention to achieve results which are unexpected and superior to compositions in the prior art.

The Final Office Action

Claims 1-4, 7 and 8 stand rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,948,353 to Lawrence et al. (the "Lawrence patent") in view of the Applicant's admission of prior art and further in view of U.K. Patent Application 737,510 to Madsen (the "Madsen patent"). This rejection is traversed respectfully.

Obviousness

The claims of a patent measure and define the invention. *Jones v. Hardy*, 727 F.2d 1524, 1528 (Fed. Cir. 1984). A determination of obviousness requires an evaluation of the prior art references with respect to the claimed invention. *Lear Siegler, Inc. v. Aeroquip Corp.*, 733 F.2d 881, 890 (Fed. Cir. 1984); *Union Carbide Corp. v. American Can Co.*, 724 F.2d 1567, 1574-75 (Fed. Cir. 1984). Obviousness cannot be established simply by combining the teachings of the prior art to produce the claimed invention. To establish a *prima facie* case of obviousness, there must be some teaching, suggestion or incentive in the prior art sufficient to motivate one of ordinary skill in the art to modify a reference or to combine reference teachings that makes such a combination appropriate. *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577 (Fed. Cir. 1984). The test of whether a particular compound described in the prior art may be relied upon to show that the claimed subject matter at issue would have been obvious is whether the prior art provides an *enabling disclosure* with respect to the disclosed prior art compound. *Ashland Oil, Inc. v. Delta Resins and Refractories, Inc.*, 776 F.2d 281, 297 (Fed. Cir. 1995), *cert. denied*, 475 U.S. 1017 (1986). The teaching or suggestion must come from the

references and not from the applicant's disclosure.

Summary of the Applicant's Argument

In the present case, the references identified in the § 103(a) rejection, taken singly or in combination, are insufficient to serve as the basis for an obviousness rejection. The essential shortcoming of the Lawrence patent, the first of the two main references, is its lack of an *enabling* disclosure of cast iron compositions containing titanium and/or vanadium. The disclosure of the use of *either* titanium *or* vanadium in the Lawrence patent is so minimal as to be, at most, merely hypothetical and therefore non-enabling. *See Ashland Oil*, 776 F.2d at 296-97. Indeed, there is nothing in the Lawrence patent that would indicate even an awareness of the problems addressed by the present invention. As a result, despite the broad disclosure in the Lawrence patent of the *optional* use of vanadium *or* titanium, there is no suggestion in the Lawrence patent that would motivate one of skill in the art to: (1) select *both* vanadium *and* titanium; (2) select the *specific amounts* of vanadium and titanium as are recognized in the claimed invention; or (3) select the *specific ratios* of vanadium to titanium that is claimed in the present invention. As a result, the Lawrence patent does not render the presently claimed invention obvious.

With respect to the Madsen patent, the compositions disclosed therein are distinct from and are not suggested by the presently claimed compositions. The amount of titanium disclosed in the Madsen patent is defined as between 1/6 to 1/2 of the amount of vanadium. When applied to the presently claimed range of vanadium (0.35 to 0.45 wt.%), the amount of titanium taught in the Madsen patent would therefore be set between 0.0583 to 0.225 wt.%, a range outside and well

above the presently claimed range of titanium (0.025 to 0.035 wt.%). Accordingly, the combination of the teachings of the Madsen patent with the Lawrence patent does not render the presently claimed invention obvious. Stated otherwise, the presently claimed composition is directed to a particular combination elements that employ vanadium and titanium within narrow ranges that are neither taught nor suggested by the prior art.

The Lawrence Patent

The Lawrence patent teaches a disc brake rotor made of gray cast iron. The focus of the Lawrence patent is on the positive effect on wear resistance resulting from the addition of small quantities of tin and also the increased quantities of chromium in iron compositions. Titanium and vanadium are mentioned in passing and only as optional extras. More specifically, apart from the mention of "small amounts (less than about 1%) of such elements as titanium and vanadium" (col. 2, ll. 4-5), there is no discussion whatsoever of the role played by either of these materials, nor is there a teaching of compositions containing either of them or both of them, or an any particular relative amounts, in any of the examples or in any of the claims. Lacking such a teaching, there is simply no *enabling* disclosure with respect to compositions containing titanium and vanadium in the Lawrence patent. At most, the disclosure of compositions which contain vanadium and/or titanium is merely hypothetical. *See Ashland Oil*, 776 F.2d at 296-97.

The § 103 Rejection Based on the Lawrence Patent

The Lawrence patent is an insufficient basis for a rejection pursuant to 35 U.S.C. § 103(a)

because its disclosure of a gray cast iron composition containing titanium and/or vanadium is merely hypothetical. None of the examples shows a formulation that includes either titanium or vanadium, let alone a composition containing both, nor does the Lawrence patent anywhere provide clear instructions on how to prepare such hypothetical compositions. *See Ashland Oil*, 776 F.2d at 296-97 (hypothetical structures are not persuasive of obviousness); *see also Application of Hoeksema*, 399 F.2d 269, 274 (Cust. & Pat. App. 1968) ("if the prior art of record fails to disclose or render obvious a method for making a claimed compound, at the time the invention was made, it may not be legally concluded that the compound itself is in the possession of the public."). Accordingly, the combination of the teachings of the Lawrence patent with the Applicant's admission regarding the prior art and Madsen is unavailing as a proper basis for rejection of the pending claims under 35 U.S.C. § 103(a). It is submitted respectfully that the rejection be withdrawn.

The Madsen Patent

The Madsen patent discloses piston rings made of cast iron. The compositions disclosed in the Madsen patent are alloys with are specified as containing between 2.50 and 3.90 wt.% carbon, 0.15 to 0.45 wt.% vanadium, and amounts of titanium and copper that are determined in relation to the amount of vanadium present in the composition. With respect to the amount of titanium, the Madsen patent teaches that the amount of titanium is determined as between 1/6 and 1/2 of the amount of vanadium.

The § 103 Rejection Based on the Madsen Patent

The Madsen patent is an insufficient basis for a rejection pursuant to 35 U.S.C. § 103(a) because it discloses compositions which neither teach nor suggest the use of titanium in the amounts claimed in the present invention. As set forth above, the compositions of the present invention include between 0.35 and 0.45 wt.% vanadium and between 0.025 and 0.035 wt.% titanium. If the teachings of Madsen were applied to determine the amount of titanium based on the amounts of vanadium used in the present invention, the range for titanium would be between about 0.058 and 0.225 wt.%.¹ It is evident, however, the claimed compositions require only between 0.025 and 0.035 wt.% titanium, a range well below and outside the range derived from the teachings of the Madsen patent. Accordingly, the Madsen patent neither teaches nor suggests the presently claimed compositions, and the combination of the teachings of the Madsen patent with the Lawrence patent and also the Applicant's admission of prior art is unavailing as a proper basis for rejection of the pending claims under 35 U.S.C. § 103(a). It is submitted respectfully that the rejection be withdrawn.

CONCLUSION

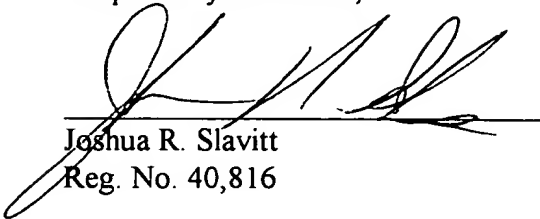
In view of the above amendment and remarks, the Applicant requests respectfully that the Examiner reconsider the outstanding rejections of the claims set forth in the Final Office Action in the prior prosecution. In addition, it is requested respectfully that the Examiner contact the undersigned by telephone at his convenience in the event the Examiner has any questions or

¹The low end would be calculated as $1/6 \times 0.35$ wt.% and the high end would be calculated as $1/2 \times 0.45$ wt.%.

comments regarding the above arguments or continues to believe that the claims remain unpatentable over the prior art.

Respectfully submitted,

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